to suggest a leaning in favor of a positive conclusion. It is certainly to be regretted that a problem of this nature should receive even so partial endorsement as is implied by the French Academy of Science. Since the conditions of the prize do not require specific investigations, but make it available for an argument indicating the position of psychology on such an hypothesis, I trust that for 1915 some candidate will present a statement that will more adequately express the views of a considerable proportion of modern psychologists upon this subject. Psychology receives so slight a recognition in scientific competitions that it seems unfortunate that its interests should be prejudiced by a recognition of a subject somewhat tangential to its main problems, and yet one upon which it has been forced to express itself in view of the widespread public concern.

JOSEPH JASTROW

SCIENTIFIC BOOKS

Flies in Relation to Disease: Non-bloodsucking Flies. By G. S. GRAHAM-SMITH, M.D. Cambridge, University Press, 1913.

A first reading of Dr. Graham-Smith's admirable book is apt in a way to somewhat dampen the enthusiasm of the ardent fly crusader. This is especially apt to be the case with one who, like the present writer, has recently been told by Stiles, after his experiences in the Carolinas, that the half has not yet been told of the danger of the house-fly, and who only the other day heard Levy of Richmond, in an address before the State Health Association, emphatically state that even the most exaggerated newspaper statements of the dangers have underestimated them. Perhaps if Dr. Graham-Smith lived in the Carolinas or in Virginia he might share to a certain degree the views of Stiles and Levy, but, living in England, and being a most careful, conscientious, and thoroughly scientific laboratory worker, he has in this book held himself down to absolutely demonstrated statements and has viewed the problem almost strictly from the medical side. He has thus produced a work which will be highly pleasing to conservative people who have diagnosed current newspaper statements about the house-fly as yellow journalism.

A second and more careful reading of the book, however, will show that there is an abundance of demonstrated facts upon which to base mose vigorous anti-fly crusades. He states that it is certain that the house-fly is a potential disease carrier and a constant frequenter and disseminator of filth, "but," he says, "much remains to be done before Howard's name, 'the typhoid fly,' or Hewitt's generalization can be completely justified." Hewitt's generalization, by the way, is "It has been proved that the house-fly plays an important part in the dissemination of certain of our most prevalent infectious diseases when the necessary conditions are present." Both Hewitt and myself (quoting from Graham-Smith) "approaching the subject from the entomological standpoint, have based their conclusions in regard to disease mainly on evidence of an epidemiological character and have apparently accepted the bacteriological evidence almost without criticism. From the bacteriological point of view, however, while the evidence relating to the carriage of pathogenic bacilli by experimentally infected flies is fairly conclusive, that relating to the presence of these microorganisms in 'wild flies' is far from complete."

The book is a very thorough and a very cautious one, and covers a consideration of the species of non-bloodsucking flies found in houses, the life history of the house fly, its internal and external anatomy in much detail, its habits, the ways in which it carries and distributes bacteria, the bacteriology of city flies, the fate of organisms eaten by larvæ, and a lengthy consideration of typhoid fever, summer diarrhea, anthrax, other bacterial diseases, the carriage of the eggs of parasitic worms, myiasis, the diseases and parasites and other enemies of flies, and questions of control. It is an admirable compendium, containing many facts not hitherto presented, and bringing together the latest information in a way in which it can be easily and intelligently consulted.

On account of the conservatism of the author, great interest attaches to such statements as he makes concerning actual danger from flies. He shows that infected flies not only carry bacteria on their bodies and limbs, thereby contaminating substances over which they walk, but distribute bacteria which they have ingested, by means of vomit and fecal deposits. He shows that, while non-spore-bearing bacteria survive at the most only twenty-four hours on the limbs, flies nevertheless infect substances over which they walk with such organisms for several days by means of a fluid which they regurgitate from their crops. He also shows that the majority of the non-spore-bearing bacilli pass through the intestine and are in living condition in the fecal deposits. He states that flies feeding upon tubercular sputum suffer from diarrhea, a fact which may be of some importance in relation to their potentiality for spreading infection. He states that city flies carry in and on their bodies very large numbers of bacteria, many of which are fecal types and that these are more numerous in flies caught in congested or dirty areas. Pathogenic bacteria or allied types have been isolated from wild city flies. "Flies bred from larvæ living in material infected with anthrax spores are capable of communicating the disease for some days after they emerge."

He admits that the evidence is very strong that flies are the dominating factor in the dissemination of typhoid fever in military and other camps and in stations in the tropics, and that there is some evidence that they are factors in causing the autumnal increase in typhoid in England, but agrees with Chapin that it is unlikely that they play an important part in well-sewered towns. The evidence in epidemic diarrhea of children he thinks is not altogether conclusive, largely I imagine because, although the disease is admittedly infectious, the causative organism has not been identified with certainty. He considers that the annual mortality due to this disease is so great that "a serious attempt to conclusively ascertain the part played by flies in its dissemination, by exterminating them in some suitable areas, usually exhibiting a high mortality, though expensive, would be justified." It is interesting to note that this is just what was done last summer in New York City by Dr. Donald B. Armstrong, of the Bureau of Public Health and Hygiene of the New York Association for Improving the Condition of the Poor, with results that are convincing, and Levy of Richmond, in an address as yet unpublished, states that he has reduced the mortality from infantile diarrhea in Richmond more than fifty per cent. by anti-fly work and great care to protect the diapers of sick children from flies. Armstrong's experiment, by the way, was accompanied by a rigid control.

With regard to cholera, he states that the evidence concerning its spread by flies is somewhat old, but is so remarkable that careful investigation is highly desirable.

Admitting that flies are greatly attracted to tuberculous sputum and can carry and distribute *Bacillus tuberculosis* for several days, he contends that whether they are serious factors in the spread of the disease remains to be proved.

Concerning the organisms of other bacterial diseases, especially ophthalmia, he states that these may be distributed by flies, but little definite evidence on the subject is available.

It is surely not the intention of Dr. Graham-Smith to underestimate the danger from flies, although his book read by the unscientific eye may produce this effect on the unscientific mind. He closes with a strong plea for careful additional observations and investigations. For the elucidation of some of the problems, while expert knowledge is required, he states that accurate observations by workers without especial scientific training will be of the greatest assistance.

The book as a whole is an excellent one. I wish that the writer might have displayed more of the arguments against flies that are not founded upon definite bacteriological examinations; but there are other books that do that, and this one is a reliable one to have

on the desk to consult from time to time upon questions of exact fact. The interest in this line of investigation is so intense at present that it is perfectly obvious that enough new facts will be accumulated in another season to warrant the adding of several chapters.

L. O. HOWARD

The Progress of Scientific Chemistry in Our Own Times. By SIR WILLIAM A. TILDEN. New York, Longmans, Green and Co. 1913. Second edition. 15 × 20 cm. Pp. v + 366. Price, $2.25 net.

The period covered by the book is from 1837 to the present. The first date was selected because Queen Victoria then came to the throne, while the scientific justification might be that at that time the influence of Liebig's teaching was beginning to be felt. After the usual preliminary chapter on Lavoisier, Cavendish, Dalton and Berzelius, we get to the book proper. We start with the conservation of energy and Joule's determination of the thermodynamic equivalent of heat. This leads at once to Hess's law of thermochemistry, to the experiments of Julius Thomsen, to Berthelot's enunciation of his principle of maximum work, and to St. Claire Deville's work on dissociation. The second chapter—which perhaps should have been the first—deals with the distribution of the chemical elements and the recognition of them by the chemist. This, of course, involves Bunsen and Kirchhoff's work on spectrum analysis, the discovery of argon by Rayleigh and Ramsay, and the isolation of the other noble gases by Ramsay. The elements being given, the third chapter deals with the determination of the atomic weights, including the theoretical reforms of Cannizzaro and the experimental researches of Dumas, Stas and others. The work of Gerhardt, Laurent and others on types is also taken up in this chapter. This seems a mistake because the work has to be discussed later in its proper place. The justification for its inclusion at this point seems to be that it was necessary in order to determine the atomic ratios of carbon to hydrogen and oxygen. While this is doubtless true historically, it would have been more artistic to have passed over this difficulty gracefully and thus to have avoided repetition.

Once we have the atomic weights determined, we are confronted with Prout's hypothesis. The third edition will undoubtedly contain the account of the resurrection of this hypothesis by Rutherford, but only a prophet could have included that in this edition. After Prout's hypothesis has been disposed of, the remainder of the fourth chapter is devoted to Mendeléeff's periodic law and its developments. The question of constitutional formulas comes up in the fifth chapter, which carries us through the work of Kekulé. The fruitfulness of Kekulé's conception is brought to our minds clearly in the account of synthetical organic chemistry in the sixth chapter. In the seventh chapter we have Pasteur's work on optically active substances, and the theory of stereochemistry as developed by van't Hoff and Le Bel. The next step, historically and logically, is from the problem of the molecular structure to that of chemical affinity, and the eighth chapter is consequently devoted to a discussion of electricity and chemical affinity.

Up to this point, the treatment has been logical and coherent; but the ninth chapter is an intercalated one on the liquefaction of gases. There is no conceivable reason for introducing this chapter at this point except that the author perhaps did not know where else to put it. As a matter of fact it should have come in just before the account of Ramsay's isolation of the noble gases of the atmosphere. Presumably it was not put there because the author wished to discuss the liquefaction of helium, which he could not do until he had introduced helium to his audience. He should however have discussed the general problem of the liquefaction of gases as an introduction to Ramsay's work and he could then have taken up the liquefaction of helium as a special fact under the general properties of helium.

If this had been done, we should have passed directly from the chapter on chemical affinity to that on radioactivity. The loose ends are gathered up in a final chapter which includes